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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DAVOR PROTIC and THOMAS KRINGS

Appeal 2009-012467
Application 10/511,734
Technology Center 2800

Before ROBERT E. NAPPI, JOHN C. MARTIN, and
JOSEPH F. RUGGIERO, *Administrative Patent Judges*.

RUGGIERO, *Administrative Patent Judge*.

DECISION ON APPEAL[1]

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the "MAIL DATE" (paper delivery mode) or the "NOTIFICATION DATE" (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134 from the Final Rejection of claims 1 and 3-12, which are all of the pending claims. Claim 2 has been canceled. An oral hearing was conducted on this appeal on June 23, 2010. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

Rather than reiterate the arguments of Appellants and the Examiner, we refer to the Appeal Brief (filed December 1, 2008), the Answer (mailed February 27, 2009), and the Reply Brief (filed April 24, 2009) for the respective details. We have considered in this decision only those arguments Appellants actually raised in the Briefs. Any other arguments which Appellants could have made but chose not to make in the Briefs are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

Appellants' Invention

Appellants' invention relates to semiconductor-based position sensitive detectors for detecting the approximate position at which a charged particle impacts the detector. The detectors include a surface region with an amorphous layer and a structured metallic layer where the structuring of the metallic layer continues through the amorphous layer and at least partially into the crystalline substrate. (*See generally* Spec. 5:18-31).

Claim 1 further illustrates the invention and reads as follows:

> 1. A position-sensitive detector for measuring charged particles comprising a crystalline substrate and a surface region, the surface region comprising an amorphous layer with a structured, metallic layer disposed above it, wherein the structure of the metallic layer continues through the amorphous layer and at least partially into the crystalline substrate.

The Examiner's Rejections

The Examiner's Answer cites the following prior art references:

A. Hamacher, H. Machner, M. Nolte, M. Palarczyk, D. Protic, & G. Riepe, *Performance of Position-Sensitive Germanium Detectors in Nuclear Reaction Experiments*, A295 NUCLEAR INSTRUMENTS & METHODS PHYSICS RES. 128-32 (Oct. 1990) [hereinafter Hamacher].

P.N. Luke, C.P. Cork, N.W. Madden, C.S. Rossington, & M.F. Wesela, *Amorphous Ge Bipolar Blocking Contacts on Ge Detectors*, 39 IEEE TRANSACTIONS ON NUCLEAR SCI. 590-94 (Aug. 1992) [hereinafter Luke].

Claims 1 and 3-12, all of the appealed claims, stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hamacher in view of Luke.

Claim 8 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

ISSUES

Based on Appellants' contentions, as well as the findings and conclusions of the Examiner, the pivotal issues before us are as follows:

a) with respect to appealed claims 1 and 3-12, did the Examiner err in concluding, under 35 U.S.C. § 103(a), that it would have been obvious to an ordinarily skilled artisan to combine the amorphous germanium (a-Ge) contact teachings of Luke with the structured position-sensitive detector teachings of Hamacher; and

b) with respect to dependent claim 8, did the Examiner err in concluding, under 35 U.S.C. § 112, first paragraph, that the ordinarily skilled artisan would not have recognized in Appellants' disclosure a description of the claimed invention in accordance with the "written description" requirement of the statute?

FINDINGS OF FACT

The record supports the following findings of fact (FF) by a preponderance of the evidence:

1. Hamacher discloses (Fig. 1; p. 128) a position-sensitive charged particle detector made of high-purity germanium and having a boron-doped contact. A metallic layer is formed over the boron-doped contact and is structured into grooved segments with the structuring continuing through the boron-doped contact and at least partially into the germanium substrate.

2. Hamacher further discloses (p. 129, left col., last para.) that the grooved segments have a width of "less than 100 µm."

3. Luke discloses (p. 590, § I (Introduction), 1st para.) that germanium-based radiation detectors include blocking contacts typically formed of lithium-doped or phosphorus-doped n-type contacts and boron-doped p-type contacts.

4. Luke further discloses (p. 590, § I (Introduction), 2nd & 3rd paras.) that amorphous semiconductor contacts, such as those formed with amorphous germanium (a-Ge), are "[a]n alternative to the contacts discussed above," and such contacts have "potential advantages over conventional contacts."

5. Luke also discloses (p. 590, § I (Introduction), 2nd para.) that a 1977 study showed high leakage currents when a-Ge contacts were deposited by vacuum evaporation, but present studies showed successful results when a-Ge contacts were formed by sputtering.

6. Luke further discloses (p. 591, left col., last para.; Fig. 2) that leakage current measurements show that "a-Ge contacts displayed excellent

blocking behavior with very low leakage currents even under high electric fields (>3000 V/cm)."

7. High leakage current is shown by Luke (Fig. 3; p. 591, right col., 1st full para.) to occur in devices in which a-Ge replaces p-type boron material (i.e., a-n-n^+), but this occurs only in "[a]bove liquid nitrogen temperatures."

8. Luke also discloses (Fig. 8; page 593, right col., 1st para.) that the a-Ge coating used for contact formation can be used as a passivation layer in the same processing step as used for contact formation, thereby eliminating a need for any separate surface treatments after contact formation.

PRINCIPLES OF LAW

Written Description

The function of the written description requirement of the first paragraph of 35 U.S.C. § 112 is to ensure that the inventor has possession, as of the filing date of the application relied on, of the specific subject matter later claimed by him. *Moba, B.V. v. Diamond Automation, Inc.*, 325 F.3d 1306, 1319 (Fed. Cir. 2003); *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563 (Fed. Cir. 1991); *In re Wertheim*, 541 F.2d 257, 262 (CCPA 1976). In establishing a basis for a rejection under the written description requirement of the statute, the Examiner has the initial burden of presenting evidence or reasons why persons skilled in the art would not recognize in an applicant's disclosure a description of the invention defined by the claims. *Wertheim*, 541 F.2d at 265.

Obviousness

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. *See In re Fine*, 837 F.2d 1071, 1073 (Fed. Cir. 1988). In so doing, the Examiner must make the factual determinations set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966) (stating that 35 U.S.C. § 103 leads to three basic factual inquiries: the scope and content of the prior art, the differences between the prior art and the claims at issue, and the level of ordinary skill in the art). Furthermore,

> "there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" . . . . [H]owever, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.

KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 418 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

ANALYSIS

I. 35 U.S.C. § 103(a) rejection

Claims 1, 3-10, and 12

With respect to the obviousness rejection of independent claims 1 and 12, Appellants' arguments focus on the contention that the Examiner has not established a basis for combining the Hamacher and Luke references. In particular, Appellants' arguments attack the Examiner's conclusion that an ordinarily skilled artisan would have found it obvious to substitute the known alternative of an amorphous germanium (a-Ge) contact for the boron-doped contact layer of Hamacher. In Appellants' view (App. Br. 9-11;

Reply Br. 4-5), they have provided evidence that establishes i) there was no motivation or need to improve the boron-doped blocking contacts of conventional detectors; ii) the use of a-Ge as a blocking contact would decrease the energy resolution of the detector device; and iii) a-Ge was not recognized as a known equivalent alternative to a boron-doped layer.

We do not agree with Appellants. As stated at page 10 of the Answer, the Examiner's rationale for the proposed combination of Hamacher and Luke is not to improve the boron-doped contacts of Hamacher. Rather, the Examiner's stated position is based on the rationale that the substitution of a known alternative equivalent contact layer, such as the a-Ge contact layer taught by Luke, for the boron-doped contact layer of Hamacher would have been obvious to the ordinarily skilled artisan and would have yielded predictable results. (*See KSR*, 550 U.S. at 416).

We find ample evidence within the disclosures of Hamacher and Luke to support the Examiner's conclusion. As pointed out by the Examiner (Ans. 8-9), Luke discloses (FF 4) that amorphous semiconductor contacts, such as a-Ge, are an alternative to the conventional n-type lithium-doped and p-type boron-doped contacts. Luke further discloses (FF 4) that sputtered a-Ge contacts can be used as blocking contacts on germanium-based radiation detectors "*with potential advantages over conventional contacts*" (emphasis added).

While Appellants argue (Reply Br. 4) that Luke's discussion of a-Ge contacts appears to be directed to replacing lithium and phosphorous contacts and not boron, we find no basis in Luke to support this contention. Luke discloses (FF 4) that "[a]n alternative to the *contacts discussed above* are amorphous semiconductor contacts" (emphasis added). Contrary to

Appellants' contention, the immediately preceding paragraph in Luke discusses (FF 3) the conventional n-type lithium and phosphorous contacts *and* p-type boron contacts, not just lithium and phosphorus contacts. Also, while Appellants make reference to Luke's discussion of a 1977 investigation of a-Ge blocking contacts in which large variations in leakage current occurred, Luke's discussion makes it clear that the 1977 investigation involved the depositing of a-Ge by vacuum evaporation. In the present study described in the cited Luke publication, however, results were successful (FF 5) when deposition was by sputtering.

Further, although Appellants' arguments suggest that Luke's disclosure is not concerned with replacing boron contacts, Appellants nonetheless recognize (Reply Br. 4) that Luke does indicate that the substitution of a-Ge for boron in forming blocking contacts has been investigated and tests have been run on the results of doing so. While Appellants contend that the tests show that the results have been poor, we do not find conclusive evidence in Luke to support this contention. To the contrary, Luke discloses (FF 6) that the "a-Ge contacts displayed excellent blocking behavior with very low leakage currents even under high electric fields (>3000 V/cm)." While the Figure 3 illustration in Luke does indicate, as argued by Appellants, that in certain circumstances high leakage current occurs in devices in which amorphous germanium replaces p-type boron material (i.e., a-n-n^+), Luke makes it clear (FF 7) that this occurs only in "[a]bove liquid nitrogen temperatures."

We also find unpersuasive Appellants' contention (App. Br. 10-11; Reply Br. 3) that neither of the cited Hamacher and Luke references discloses a position-sensitive detector with a *structured* a-Ge layer. In

particular, Appellants argue that the Luke reference, relied upon by the Examiner as providing a teaching of using an a-Ge layer for a blocking contact, does not disclose that such a-Ge layer should be structured as claimed. Further, Appellants argue (App. Br. 5-6; Reply Br. 5) that Luke, beyond lacking a disclosure of structuring the a-Ge layer, actually teaches that it would be advantageous to leave the a-Ge layer unstructured so that it can be used as a passivation layer.

It is apparent from the Examiner's stated position (Ans. 3), however, that it is Hamacher that is relied upon as providing a teaching (Fig. 1) of a structured position-sensitive detector, i.e., one in which the structuring of the aluminum metallic layer continues through the boron-doped contact and also at least partially through the semiconductor germanium substrate. The Luke reference is relied upon for teaching the use of an a-Ge contact layer as an equivalent alternative to the boron-doped contact layer of Hamacher. As a consequence of the Examiner's proposed combination, the resulting position-sensitive detector would have the metallic layer structuring continue through the a-Ge contact and at least partially through the crystalline germanium substrate as claimed.

Further, Appellants' arguments to the contrary notwithstanding, we do not interpret the disclosure of Luke as requiring a passivation layer or that the a-Ge blocking contact layer must be left unstructured to serve as the passivation layer. We agree with the Examiner's interpretation (Ans. 9) of Luke's disclosure as teaching two separate and distinct uses for the a-Ge layer. One disclosed use of the a-Ge layer is to form a blocking contact in combination with a metallic layer and the other (FF 8) is that the a-Ge layer *can be* used as a passivation layer in the same processing step as used for

contact formation, thereby eliminating a need for any separate surface treatments after contact formation. We find, however, no teaching or suggestion in Luke of any *requirement* for a passivation layer. We also find it particularly noteworthy that the structured position-sensitive detector of Hamacher has no disclosure of any surface passivation layer, or any need for such a passivation layer.

Lastly, we are not persuaded by Appellants' argument (App. Br. 9-11; Reply Br. 4-5) that the poor energy resolution due to high leakage currents exhibited by a-Ge contacts would lead the ordinarily skilled artisan away from using them in position-sensitive radiation detectors. Initially, we agree with the Examiner (Ans. 11-12) that the evidence presented by Appellants does not conclusively establish that the potential degradation of energy resolution is due solely to the amorphous germanium contacts. We also agree with the Examiner (Ans. 10-11) that there is no evidence of record which would support Appellants' contention that energy resolution is an important factor in all radiation detector applications. To the contrary, Appellants' own presented evidence (Protic declaration of Jan. 31, 2008, paras. 9-10) suggests that the problem of poor energy resolution due to high leakage currents does not exist at the operating temperature of commercial germanium-based position-sensitive detectors.

For the above reasons, we sustain the Examiner's 35 U.S.C. § 103(a) rejection of independent claims 1 and 12, as well as dependent claims 3-10, not separately argued by Appellants.

Claim 11

The Examiner's obviousness rejection of dependent claim 11, based on the combination of Hamacher and Luke, is also sustained. We agree with the Examiner's finding (Ans. 12), which cites to MPEP § 2144.05 (8th ed., rev. 7, July 2008) and is not addressed in the Reply Brief, that the claimed groove segment spacing of "less than 20 μm" lies within the "less than 100 μm" range disclosed by Hamacher. (FF 2). It is well settled that a prima facie case of obviousness exists when a claimed range overlaps the ranges disclosed in the prior art. *See In re Geisler*, 116 F.3d 1465, 1469 (Fed. Cir. 1997); *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990); *In re Malagari*, 499 F.2d 1297, 1303 (CCPA 1974). Since it is apparent that the factual situation presented to us here establishes that Hamacher's disclosed groove spacing of "less than 100 μm" overlaps Appellants' claimed "less than 20 μm," a prima facie case of obviousness exists.

A prima facie case of obviousness based on overlapping ranges can be rebutted by an indication of the criticality of the claimed range, such as by a showing of unexpected results relative to the prior art range. *Woodruff*, 919 F.2d at 1578. In the present case, however, Appellants have not alleged, much less established, either in the disclosure of the invention or the presented arguments, that the claimed segment groove spacing range is critical or produces unexpected results. To the contrary, Appellants' disclosure (Spec. 6:17-23) indicates that the segment spacing of "less than 20 μm" is a preferred value but not critical.

II. 35 U.S.C. § 112, first paragraph, rejection

The Examiner has taken the position that Appellants' disclosure lacks a written description of the claimed feature of an amorphous layer "wherein the amorphous layer is not doped" as recited in amended dependent claim 8. According to the Examiner (Ans. 5-6, 12-14), Appellants' disclosure (Spec. 6:11-7:9) is silent about the doping characteristics of the amorphous layer, i.e., there is no express disclosure that the amorphous layer is doped or undoped.

We find unpersuasive Appellants' argument (App. Br. 11) that the description in the disclosure (Spec. 6:11-7:9) that the application of the metal layer subsequent to the sputtering or vapor deposition of the amorphous germanium layer would suggest to the ordinarily skilled artisan that the amorphous layer is undoped. We agree with the Examiner (Ans. 13-14) that Luke (p. 590, § II), which describes the formation by sputtering of a doped amorphous germanium layer prior to the subsequent application of a metal layer over an amorphous germanium layer, provides evidence that the subsequent application of a metal layer over an amorphous germanium layer does not imply that the amorphous germanium layer must be undoped.

In view of the above discussion, it is our opinion that, under the factual situation presented in the present case, the statutory written description requirement has not been satisfied because Appellants were clearly not in possession of the claimed invention at the time of filing of the application. Therefore, we sustain the Examiner's rejection of claim 8 under the first paragraph of 35 U.S.C. § 112.

CONCLUSION OF LAW

Based on the findings of facts and analysis above, we conclude that the Examiner did not err in rejecting claims 1 and 3-12 for obviousness under 35 U.S.C. § 103(a), nor in rejecting claim 8 under 35 U.S.C. § 112, first paragraph.

DECISION

The Examiner's decision rejecting appealed claims 1 and 3-12 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(v) (2009).

AFFIRMED

babc

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